

## Sustainable Malaria Education:

Epidemiology survey on malaria knowledge and behavior among  
elementary school children in East Lombok (ESMKB AESCEL)

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### 〔抄 録〕

WHO (世界保健機関) は 1998 年から、マラリア罹患者の半減を目指し、Roll Back Malaria Program をスタートした。世界各国とともに長年にわたる多大な努力を重ねてきたが、マラリアは現在においても、熱帯途上国を中心に深刻な医療健康問題である。東南アジア諸国では 430 万人が罹患し、2426 人が公式に犠牲となっている (WHO レポート, 2011)。インドネシアにおいても、マラリアはパプア、スマトラ、カリマンタン、セレベス、マルク、東西ヌサテンガラなどの周辺地域で依然として、最悪の感染症の一つである。

西ヌサテンガラ州のロンボク島では、2005 年にマラリア・アウトブレイクが発生し、多くの患者と死者が出た。マタラム大学医学部ムリヤント教授と佛教大学社会学部満田との国際共同研究チームは、2006 年からアウトブレイクが発生した東ロンボクの 4 つの地区で、マラリア感染拡大に関する社会疫学調査 (CBDESS I and II) を実施した (Mitsuda and Mulyanto; 2006, 2007, 2008, 2009)。さらに、マラリア制圧を目指した社会学的手法、とくに CBDESS 調査を支援したマラリア専門員による地域力向上 (community empowerment) を試み、マラリア死者がゼロという一定の成果を上げた。

本研究では、前回の世帯主を対象としたマラリア社会疫学調査 (CBDESS) に準拠し、同一地域の小学生 400 名を対象に「マラリア知識と行動に関する社会疫学調査」(ESMKB AESCEL) を実施。調査結果を医学生が医学知識とともに指導することで、小学生へのマラリア教育を実践した。さらに Health Messenger として「マラリア見守り隊 (Malaria School Scout: MASCOT)」を創設し、この小学生活動を通して、家庭、学校、地域などでマラリア制圧プログラムを浸透させる試みをおこなう。

ESMKB AESCEL のデータをパス解析することで、「子供のマラリアに関する情報源」の因果律を検証すると、マスメディアや医療関係者でなく、「母親」の影響、とくにその学歴が最重要な要因であった。「MASCOT」プロジェクトでは、今後とも母子の健康と教育に焦点を当てたプログラムを実践する。

キーワード Malaria control, Health messenger, Epidemiological survey, School children, Malaria School Scout (MASCOT)

## 1. Introduction

### 1.1 Background

Malaria is a significant public health problem and has greatly impaired socioeconomic development in developing countries<sup>(1)</sup>. Despite many years of continuous efforts such as Roll Back Malaria Program promoted by World Health Organization (WHO) in 1998, malaria remains one of the major causes of morbidity and mortality affecting tropical third-world, including Southeast Asia<sup>(2)</sup>. According to WHO Malaria Report 2011, it was calculated that 4.3 million cases of malaria and a total of 2426 malaria deaths were reported in Southeast Asia in 2010 alone<sup>(3)</sup>. Among the countries facing the risk of malaria in Southeast Asia, Indonesia has been reported to have little change in terms of downward trends<sup>(3)</sup>.

Although West Nusa Tenggara has been categorized as a medium endemicity area for Malaria, some areas have been identified as high endemicity area<sup>(4)</sup>. In 2005, there was a severe outbreak of malaria in East Lombok District, which was responsible for 1443 clinical cases and 14 deaths<sup>(4)</sup>. In responding towards this outbreak, a qualitative study was conducted to examine sociological and epidemiological aspects that influenced the 2005 epidemic occasion, followed by a comparative, cross sectional study to explore the demographic and geographic characteristic as well as other factors influencing malaria expansion and community empowerment to fight against malaria<sup>(4)</sup>. The study was referred to CBDESS I and II (Collecting Baseline Data and Epidemiological/Sociological Survey), a collaborative study performed by Professor Mitsuda, Faculty of Sociology, Bukkyo University and Professor Mulyanto, School of Medicine, Mataram University since 2006 until 20074.

The CBDESS I and II are focused on several villages in East Lombok. These villages include Pijot and Tanjung Luar (categorized as high endemicity) as well as Batunampar and Sukaraja (categorized as moderate endemicity)<sup>(4)</sup>. Over the past few years, the malaria incidence in those areas showed significant decrease: in Jerowaru 0.11, Keruak 0.20 and Sukaraja 0.19 as in the calculation of the Annual Parasitic Index (API) in 2011<sup>(5)</sup>. The involvement of all components of the society contributed to the decrease of malaria incidence is leading to the optimistic view that malaria would be successfully eradicated in the near future. Yet, there are still some concerns about maintaining the achieved low incidence of malaria.

The CBDESS project showed that local citizens of those areas had a low level of knowledge and behavior related to malaria control. Moreover, 70% of respondents in the district did not accomplish beyond the elementary school level. Without proper approach, they will grow as citizens remaining at the same low level of knowledge and behavior as

their parents<sup>(4)</sup> exactly when they are held responsible for malaria control program in their community. This conditions can threaten the continuation of malaria control program in those areas resulting in the rise of malaria incidence in the future. Therefore, seeking reliable approaches is essential to increase the knowledge and prevention behavior among young children particularly elementary school children.

School children have been increasingly recognized as agents of change for their potential to distribute health messages to other children, family members and local people in the community<sup>(6)(7)</sup>. This approach has been adopted in several developing countries to promote community understanding and empowerment on malaria<sup>(7)(8)</sup>. As an example, Nonako et. al. reported that elementary school children in grade 3–5 were able to act as effective health promoters for malaria control in the province of Oudomaxy, Lao DPR<sup>(7)</sup>. Furthermore, a study in Ghana presented by Ayi et. al. concluded that engaging school children as health messengers had significant impact on improving knowledge towards malaria and practices of its prevention in the community<sup>(9)</sup>.

To maintain the achieved low incidence of malaria in the four villages of East Lombok (Tanjung Luar, Batunampar, Pijot and Sukaraja), therefore a school-based approach is a potential option. However, it is essential to conduct a preliminary and overlooking study on the related aspects before any means of school based intervention is promoted: Current level of knowledge and behavior among school children need to be assessed. Potential ways of increasing knowledge and behavior should also be identified. Extensive research will benefit designing the most suitable approach to ensure the continuation of malaria control program in those areas.

## 1.2 Objectives

The general objective of this study is to collect epidemiological data on malaria knowledge and behavior among elementary school children in East Lombok.

The specific objectives of this study are:

- To Identify elementary school children characteristics
- To Identify family characteristics
- To Identify malaria experience among elementary school children and family members
- To Identify malaria knowledge among elementary school children.
- To Investigate factors associated with the levels of malaria knowledge among elementary school children including parent's education level and source of information
- To Identify susceptible behaviors and anti-mosquito utilization related with malaria transmission among children
- To Identify utilization of anti-mosquito measures and products in the household

The baseline data generated from this study would give sufficient background informa-

tion on the essential aspects regarding malaria knowledge and behavior, which are critically important in the developing process of a suitable school based intervention approach for elementary school children in East Lombok. In the long run, these school children are expected to play an important role as effective health messengers to facilitate widespread dissemination of malaria knowledge and behavior.

### 1.3 Methods

#### 1.3.1 Study Area

The villages included in this study, namely Sukaraja, Batunampar, Tanjung Luar and Pijot were previously categorized in moderate and high malaria endemicity in East Lombok in 2005. Pijot and Tanjung Luar villages are located in Keruak sub-district, while Batu Nampar and Sukaraja village are located in Jerowaru sub-district. Over the last few years, the number of malaria incidence has declined in the four villages: in Jerowaru 0.11, Keruak 0.20 and Sukaraja 0.19 as in the calculation of the Annual Parasitic Index (API) in 2011<sup>(5)</sup>. The four villages were previously the site for CBDESS Part I project as

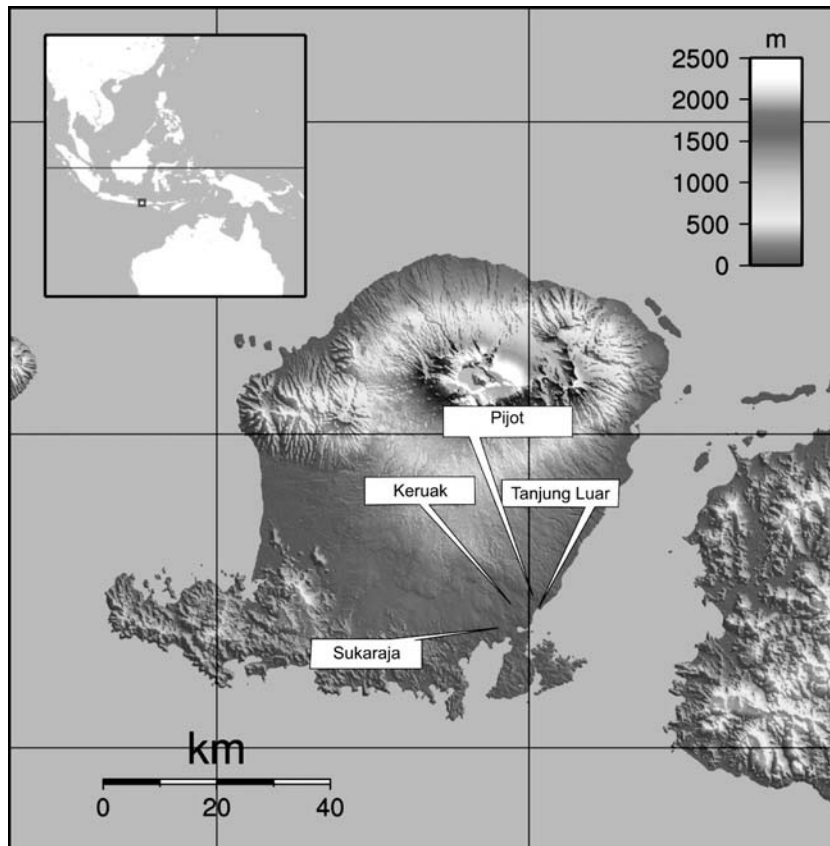


Figure 1.1 Map showing locations of CBDESS + S in Lombok

shown in Figure 1.1.

East Lombok covers a total area of approximately 2,679.88 km<sup>2</sup>, comprising of 160,55 km<sup>2</sup> (59.91%) mainland and 1074.33 km<sup>2</sup> (40.09%) sea area. Land area of East Lombok covers 33.88% of the total land area in Lombok. In 2011, approximately 45,813 ha (28.53%) are wetland whereas 114,742 ha (71,475) are dry land. East Lombok has a tropical climate with mean monthly rainfall of 1.528 mm and an average days of rain as 8 days per month<sup>(10)</sup>.

Population of East Lombok is 1,116,745 in 2011, which has increased 1.01% compared to 2010. Keruak sub-district is categorized as medium density (1000–2000 inhabitants per km<sup>2</sup>), while Jerowaru is classified as low density (<1000 inhabitants per km<sup>2</sup>). Pijot village is approximately 6.8 km<sup>2</sup> with 6609 inhabitants. Tanjung Luar village is a smaller village, approximately 2.36 km<sup>2</sup> with 12,638 inhabitants. Batunampar village is approximately 9.24 km<sup>2</sup> with 5007 inhabitants, whereas Sukaraja is 14.38 km<sup>2</sup> with 11,517 inhabitants<sup>(11)(12)</sup>.

### 1.3.2 Target Population

In total, there are 24 elementary schools located in targeted area of this study. There are approximately 9 schools in Sukaraja village. The average numbers of school children attending each school in Sukaraja are 151. Whereas in Batunampar there are 4 schools in total with 161 as the average number of school children attending each school. Tanjung Luar has 7 schools in the village where the average numbers of school children attending each school are 288. There are approximately 4 schools located in Pijot village with 227 as the average number of school children attending each school<sup>(13)</sup>. For this study, a total of 8 schools were selected with 2 schools in each village. School children in the grade 5–6 in the selected schools are included as shown in Table 1.1.

Table 1.1 Selected schools for the CBDESS + S Study

Village	Elementary school	Grade 5	Grade 6	Total
Sukaraja	SDN 2 Sukaraja	30	21	51
Batunampar	SDN 4 Sukaraja	21	29	50
Tanjung Luar	SDN 2 Batunampar	21	29	50
Pijot	SDN 3 Batunampar	25	23	48
	SDN 1 Tanjung Luar	25	25	50
	SDN 4 Tanjung Luar	25	24	49
	SDN 2 Pijot	24	26	50
	SDN 3 Pijot	14	36	50
TOTAL				398

The schools selected in this study had an average of 214 school children attending each school. There were 10–18 teachers in each school. The majority of schools had a School Health Unit, a national school based health program. However, due to lack of resources, the School Health Unit is not currently active. As part of the sport and health education

subject, there are some forms of health education integrated in the school curriculum. General hygiene is the main health topic in schools and taught by physical education teachers along with the staffs from the community health center (*Puskesmas*). The staffs in the *Puskesmas* responsible for promoting health education to elementary school children usually organizes monthly visit to each school, however, due to lack of human resources, the continuity and sustainability of the programs for Health Unit in schools are not always ensured. Moreover, there is no specific form of malaria education integrated in the curriculum.

### 1.3.3 Study Design

This study was a community based cross-sectional and an interview-guided survey covering eight selected elementary schools in East Lombok. A structured questionnaire was developed and modified for elementary school children based on CBDESS studies in 2006 and 2007, particularly pertaining to knowledge and behaviors of Malaria.

The questionnaire was pre-tested for ascertaining consistency, appropriateness of language and sequencing before finalization. The data was then collected through face to face interview by medical students of native Sasak speakers at Mataram University. A training program was conducted beforehand for all volunteers on the study of CBDESS + S. For a complete and accurate data collection, the program emphasized the volunteers understanding of the questionnaire contents and strategies to establish the rapport and neutrality.

The aspects investigated in this study are: respondent's characteristics, family characteristics, malaria knowledge, susceptible behaviors and utilization of anti-mosquito products among respondents, utilization of anti-mosquito products in the household, and malaria experience among respondents and the family members.

Respondent's characteristic includes age, sex, religion and ethnicity. The family characteristic incorporates questions referring to the number of siblings, parent's occupation and educational status. These baseline data would provide basic information on socio-economic background of school children and their family.

The variables of malaria knowledge were determined by four constructs i.e., malaria symptoms, transmission, prevention and treatment. The individual knowledge level of each construct was observed in order to determine the overall level of malaria knowledge. The overall level of malaria knowledge composed of previously mentioned four constructs was scaled and divided into three degrees of malaria knowledge, i.e., "Good" (being aware of all four constructs), "Moderate" (being aware of two to three constructs) and "Poor" (being aware of one construct or none).

The first construct of malaria knowledge is malaria symptom. The classical symptoms of malaria are fever accompanied with chills and sweating. Other symptoms may be headache and joint pains. Respondents were asked to mention any malaria symptoms

they know. The knowledge level on malaria symptoms was classified into “Good” (knowing at least three symptoms of malaria), “Moderate” (knowing two malaria symptoms) and “Poor” (knowing only one symptom or none).

Knowledge on malaria transmission comprises two criteria: classification of malaria as a communicable disease and its mode of transmission. Level of knowledge on malaria transmission was also classified into “Good” (knowing two criteria), “Moderate” (knowing one criteria) and “Poor” (knowing non of the criteria).

As the third construct, knowledge on malaria prevention involves three criteria: human behaviour modification, environmental management and vector control. Level of knowledge on malaria prevention was also classified into “Good” (knowing three constructs), “Moderate” (knowing two constructs) and “Poor” (knowing one construct or none).

The fourth construct is level of knowledge on malaria treatment. In this construct, respondents were asked about health seeking knowledge. Respondents had good level of malaria treatment knowledge particularly in the situation to seek help from either doctor /hospital/*Puskesmas* when suffering from malaria.

Susceptible behavior associated with malaria of respondents and family members was also identified. The questions regarding susceptible malaria behavior among respondents include frequent outdoor activities at night and anti-mosquito measures. Furthermore, respondents were also asked about their behavior associated with malaria in the household: utilization of anti-mosquito products, family members responsible for the preparation of anti-mosquito products. Finally, previous malaria experience of respondents and family members was also observed.

## 2. Results of CBDESS+S

### 2.1 Respondent's Characteristics

A total of 398 elementary school children (5–6 grade) from four villages in East Lombok participated as respondent in this study, including 101 (25,4%) from Sukaraja, 98 (24.6%) from Batunampar, 99 (24.9%) from Tanjung Luar and 100 (25.1%) from Pijot. In general, the sex ratio of respondents in this study is 194 (48.7%) male and 204 (51.3%) female. The age ranges from 10 to 13 years old with the majority age of 11 (41.5%). The major religion and ethnic group are Islam (100%) and Sasak (92%) respectively. Comprehensive descriptions of respondent's characteristics are presented in table 2.1.1.

Table 2.1.1 Respondent's characteristics

Characteristic	N = 398 h (%)
Age	
10	110 (27.6)
11	165 (41.5)

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12	102 (25.6)
13	21 (5.3)
Sex	
Male	194 (48.7)
Female	204 (51.3)
Religion	
Islam	398 (100)
Ethnicity	
Sasak	368 (92)
Sumbawa	10 (3)
Bima	10 (3)
Java	5 (1)
Bali	1 (0)
Others	4 (1)

In terms of family characteristics, the majority of respondents have 3 or less siblings (80%). Most of the fathers of school children are employed (93%) and predominant occupations are farmer (38.9%) followed by fisherman (24.1%). The majority of mother's occupation is farmer (40%) followed by housewife (35%). These results have similarities with previous finding from CBDESS I and II. A more detailed description of family characteristic is presented in Table 2.1.2.

Table 2.1.2 Family Characteristics

Characteristic	N = 398 (%)
Number of siblings	
0	21 (5.3)
1	90 (22.6)
2	147 (36.9)
3	62 (15.6)
4	36 (9.0)
5	14 (3.5)
>5	28 (7.1)
Father's occupation	
Government employee	5 (1.3)
Army	3 (0.8)
Teacher	7 (1.8)
Labour	24 (6.0)
Private sector	23 (5.8)
Fisherman	96 (24.1)
Farmer	155 (38.9)
Works Overseas	30 (7.5)
Unemployed	26 (6.5)
Others	29 (7.3)
Father's Education Level	
No Formal Education	71 (17.7)
Uncompleted Elemenatry School	51 (12.8)
Elementary school Graduate	169 (42.5)
Junior High School Graduate	64 (16.1)
Senior High School Graduate	29 (7.3)
Diploma Graduate	1 (0.3)
College Graduate	13 (3.3)



Mother's Occupation		
Housewife	138	(34.6)
Teacher	3	(0.8)
Private Employee	21	(5.3)
Farmer	160	(40.2)
Labour	29	(7.3)
Works Oversease	11	(2.8)
Others	36	(9.0)
Mother's Education Level		
No Formal Education	78	(19.6)
Uncompleted Elemenatry School	67	(16.8)
Elementary school Graduate	145	(36.4)
Junior High School Graduate	66	(16.6)
Senior High School Graduate	34	(8.5)
Diploma Graduate	1	(0.3)
College Graduate	7	(1.8)

The majority of parent's education level is elementary school graduate: Approximately 55% of fathers and 53% of mothers. There are also a considerable number of respondent's parents without any formal education in life, 18% of fathers and 20% of mothers. These results share similarities with CBDESS I and II. However, the gender variation on educational achievement of parents in this study is less distinctive compared to CBDESS I and II results. The number of fathers attending schools is higher than those of mothers as seen in Figure 2.1.1.

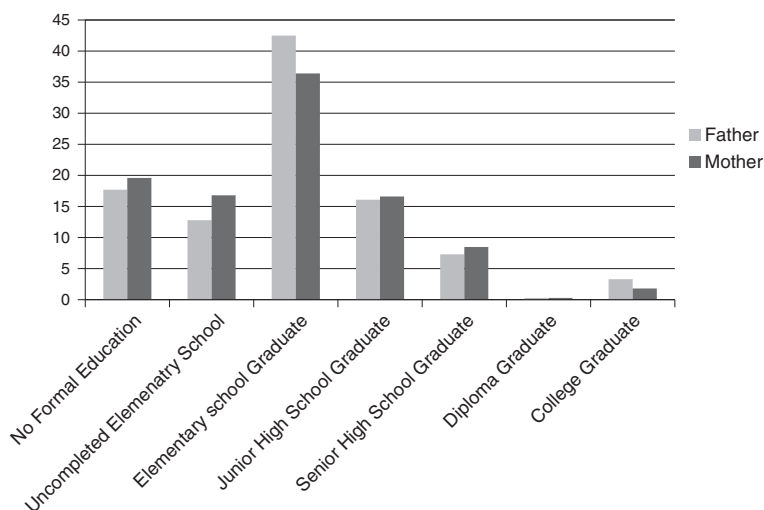


Figure 2.1.1 Distribution of Parents Formal Education

## 2.2 Source of information on malaria

Approximately 64% respondents have heard of the term malaria and 67% respondents are familiar with the local term of malaria. The three major sources of information on

malaria are parents (31%), television (26%) and school (23%) as seen in Figure 2.2.1. Parents are the most predominant source regarding malaria information. It could be implied that parents, particularly mothers, may have a key agenda to evoke further awareness of malaria knowledge and prevention. From CBDESS I and II, we learned that the elementary source of information on malaria in adults (in this case of parents) is health care professionals, and the information that parents received should be passed on to their children. Television is also another source of information on malaria for children functioning as an entertaining means of learning.

School also has a respective proportion as one of the important main sources of malaria information. In general, a specific curriculum on malaria has not yet been established for elementary school in East Lombok. Health issues addressed at elementary school children in East Lombok are general hygiene and sanitation, mainly taught within the Physical Education program at school or once a week visit of health care staffs from *Puskesmas*. According to the finding from this study, physical education teachers in several schools have the initiative in giving general information on malaria to school children. However, teacher's expand capacity on malaria knowledge are highly required for adequate contribution to the children's education on malaria.

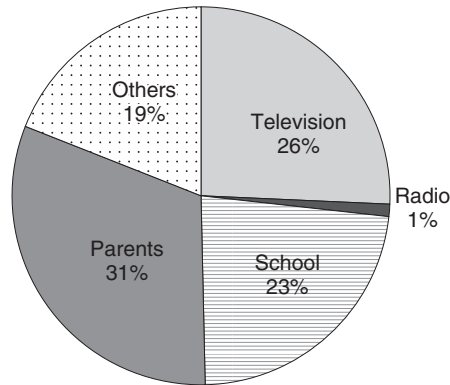


Figure 2.2.1 Source of information on Malaria

### 2.3 Malaria Experience

In regards to malaria experience, approximately 20.6% of respondents and 43.2% of family members have suffered from malaria in their life (Table 2.3). It should be mentioned that since malaria experience variable is only based on children's self-judgment, potential recall bias or wrong diagnosis are undeniable. The malaria disease causes similar symptoms to those of other diseases, thus further confirmation is highly required at least by their family members and mostly preferably by medical practitioners.

Table 2.3 Malaria Experience

Malaria Experience	N = 398 (%)
Respondents experience of malaria	
Yes	82 (20.6%)
No	202 (50.8%)
Do not know	114 (28.6%)
Family members experience of malaria	
Father	54 (13.6)
Mother	21 (5.3)
Brother	18 (4.5)
Sister	20 (5.0)
Grandmother	4 (1.0)
Grandfather	6 (1.5)
Other	8 (2.0)
Do not know	267 (67.1)

## 2.4 Malaria Knowledge

There are four constructs that build the overall level of malaria knowledge: symptoms, transmission, prevention and treatment. According to this study, respondents in four villages show a significant lack of malaria knowledge. As shown in Figure 2.4, approximately 69.3% of respondents are at “Poor” level on malaria knowledge, 28.9% at “Moderate” and merely 1.8% respondents were at “Good” level. The findings above in CBDESS + S showed relatively similar results with the CBDESS in 2006, where 60.2% adult respondents had “Poor” level of knowledge on malaria.

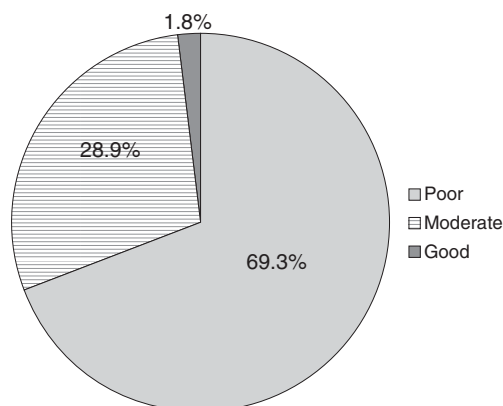


Figure 2.4 Overall level of Malaria Knowledge

The levels of knowledge for each construct are further described in Figure 2.2.2. Approximately 11.8% respondents were classified to have good level of malaria knowledge, whereas 21.1% respondents had good level of knowledge on malaria transmission and only 15.3% respondents had relatively good level of knowledge on malaria transmission. With regards to the variables of malaria health seeking knowledge, malaria treatment showed the highest proportion of “Good” (77.6%) among four criteria.

According to these findings, the aspects such as malaria transmission, prevention and treatment should be well emphasised in the development process of a school based malaria intervention. However, with regards to health seeking knowledge, children show a positive shift of mindset: The majority of children prefer medical doctors or hospital/ *Puskesmas* (Community Health Center) as means of malaria treatment. This would suggest that the health care providers have a great potential taking part of a school-based intervention in order to develop adequate health issues education for children.

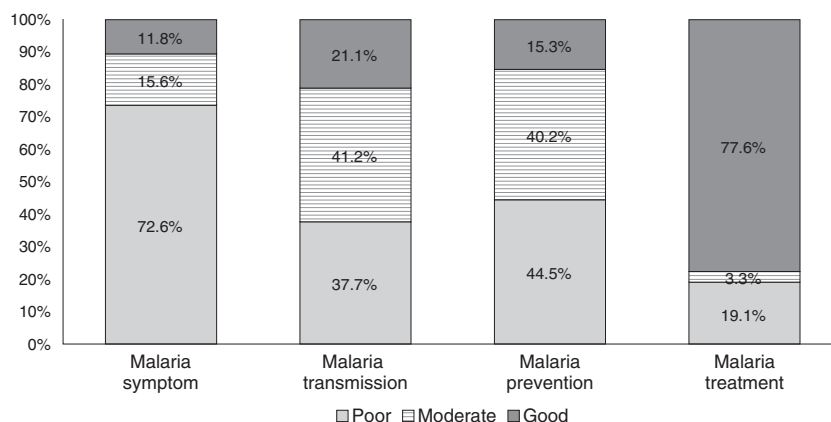


Figure 2.2.2 Level of malaria knowledge on: symptoms, transmission, prevention and treatment

Knowledge on prevention behavior was targeted in three aspects: modifying human behavior, managing the environment and controlling vectors. Among the four constructs that build the overall knowledge on malaria, malaria prevention knowledge was the lowest with 77.6% respondents classified in poor knowledge.

As additional information in terms of malaria prevention knowledge, respondents were asked if they could identify potential mosquito breeding sites around their house (Figure 2.2.3). As much as 55.5% respondents were unable to identify any of them. This would suggest that identifying potential mosquito breeding sites is an aspect to be emphasized in a school based malaria intervention. The ability of school children to identify this aspect would potentially increase their awareness of malaria prevention behavior. Traditional opened water source (24.4%) was frequently mentioned among respondents who were able to identify common mosquito breeding sites around their house.

An interesting fact is that despite the low level of school children's knowledge on malaria, they have heard of the term malaria or its local term. As previously mentioned, the major sources of information on malaria were parents followed by television and school. It is likely that the information on malaria provided by parents and schools may not be sufficient. It is also possible that children may have had difficulty in keeping accurate information on malaria derived from television, or have mistaken malaria for other

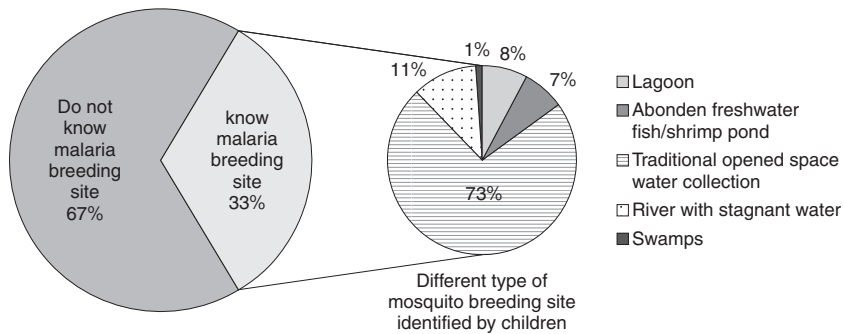


Figure 2.2.3 Knowledge on potential breeding sites around the house

mosquito-born disease such as dengue, which unfortunately might contributed to the results as of the low level of malaria knowledge among elementary school children.

Furthermore, a path analysis was conducted to determine the correlation between variables and level of knowledge on malaria (Figure 2.2.4) with hypotheses that children's knowledge would be affected by their preferred source of information and that their tendency toward a certain choice of information sources would be influenced by their parent's education.

From the path analysis, we see small interactions between each variable in our proposed path. Nevertheless, an interesting factor could be pointed out that, more than father's education, mother's education correlate highly with children's preference on the choice of information sources.

The small contribution of the combined variables that shapes the level of knowledge included in the path analysis of this study may due to several factors: The accuracy level of the information regarding the source of information of malaria knowledge and possible recall bias. Furthermore, other potential variables such as school curriculum have not yet been included in this study, which should have a greater contribution in shaping the children's knowledge of malaria.

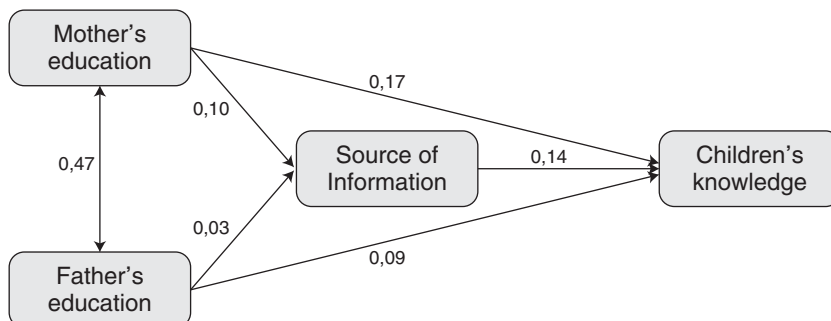


Figure 2.2.4 Path Analysis on relationship between Children's malaria knowledge, parents' education level, and source of malaria information

## 2.5 The susceptible behaviors and anti-mosquito measures related to malaria among children

It is well known among local people in Lombok that there are particular high-risk malaria behaviors: outdoor activities at night are commonly identified as high risk malaria behavior. This study reveals 71% of respondents answered “frequently do outdoor activities at night.” The two common outdoor activities at night are going to the mosque to learn Quran (54.6%) followed by doing outdoor games (34.5%). Among respondents who did frequent outdoor activities (N=284), 60.9% used anti-mosquito products and a proportion of 39.1% do not use any anti-mosquito products during outdoor activities. The three most common and frequent anti-mosquito measures for children are anti-mosquito lotion (63%), protective clothing (24.9%) and anti-mosquito coil (9.8%). Further details are described in Table 2.5.

Table 2.5 Susceptible behavior and anti-mosquito measures during outdoor activities at night at night among children

Malaria Experience	Frequency (%)
Any frequent outdoor activities at night (N = 398)	
Yes	284 (71.4)
No	114 (28.6)
Type of outdoor activities at night (N = 284)	
Learning Quran at the mosque	155 (54.6)
Playing outdoor	98 (34.5)
Studying in open spaces	6 (2.1)
Others	25 (8.8)
Anti-mosquito measures during outdoor activities at night (N = 284)	
Yes	173 (60.9)
No	111 (39.1)
Varied types of anti-mosquito measures (N = 173)	
Anti-mosquito lotion	109 (63.0)
Protective clothing	43 (24.9)
Anti-mosquito coil	17 (9.8)
Other	4 (2.3)

## 2.6 Anti-mosquito measures and utilization of the products in the household

The majority of respondents answered that they have certain anti-mosquito measures and use products very commonly in the household. Approximately 88.9% of household-shave some form of anti-mosquito products kept at home: The majority of households have at least one type of anti-mosquito products (42.7%) followed by two different types of anti-mosquito products utilized at home (31.7%). Approximately 84.2% respondents regularly own bed net at home.

Approximately 56% of respondents regard their mothers as having the initiative of preparation and utilization of anti-mosquito products among family members. This would suggest that mothers would be capable to play a significant role for the prevention of ma-

Table 2.6 Malaria prevention practices of respondents and family members

Behaviors	Frequency (%)
Utilization of anti-mosquito products in the household (N = 398)	
Yes	354 (88.9)
No	44 (11.1)
Varied types of anti-mosquito products utilized (N = 398)	
none	44 (11.1)
1 type	170 (42.7)
2 types	126 (31.7)
3 types	49 (12.3)
4 types	7 (1.8)
>4 types	2 (0.5)
Utilization of bed net in the household (N = 398)	
Yes	335 (84.2)
No	63 (15.8)
Bed net utilization among family members (N = 335)	
All member	222 (66.3)
Father	14 (4.2)
Mother	25 (7.5)
Children	61 (18.2)
Grandparents	13 (3.9)

laria as well as other diseases transmitted by mosquito around their house. A more detailed description regarding anti-mosquito products utilization of malaria in four villages are described in Figure 2.6.

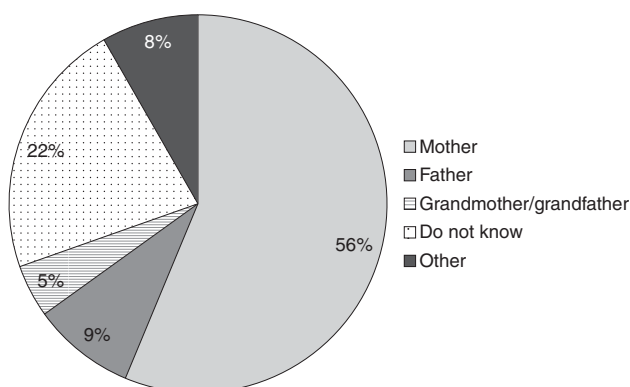


Figure 2.6 Family members responsible in the preparation of anti-mosquito products in the household

## 2.7 Conclusion

The majority of elementary school children in our study have relatively poor knowledge on malaria. In terms of a school-based intervention, the constructs that should be emphasized are malaria symptoms, transmission and prevention. Despite the very low level of knowledge on these three aspects of malaria knowledge, a high level of knowledge on malaria treatment is shown as well. The majority of school children are well aware of seek-

ing treatment from health care professionals, which is a welcome and positive shift of mindset. Young generations have more flexibility of mind and prefer to seek treatment from health care professionals than traditional healers.

School has a reasonable proportion as one of the sources of information regarding malaria. Since malaria knowledge still remains at low level, teacher's expand capacity on malaria knowledge are highly required for further adequate contribution to the children's education on malaria. As previously mentioned, schools in East Lombok do not have a curriculum to integrate knowledge on malaria. A school-based intervention has a great potential in the development process of children's malaria education. With a support from teacher and *Puskesmas* (Public Health Center), it must lead school children to become the health messengers.

In this study, the variables in our proposed path analysis showed poor correlation between children's knowledge on malaria. The factors that have been looked upon in this study are parent's education level and source of information. Further potential factors, which should be contributing to shape children's knowledge on malaria, should be investigated.

The majority of children do outdoor activities at night such as learning Quran in the mosque as the most frequent activity. Among the children who do frequent outdoor activities at night, 40% are without any measure to prevent from mosquito bites, which leaves them susceptible to malaria.

In regards with malaria practice, the majority of family (88.9%) utilized some form of anti-mosquito products. The most common form of anti-mosquito products owned in the household is bed net (88.9%). Mothers have the initiative of preparation and utilization of anti-mosquito products among family members. This would suggest that mothers would be capable to play a significant role for the prevention of malaria in the household.

### 3. Research Agenda and Political Implication

Based upon this study, there are potential future works that should be carried out. A school-based intervention to increase children knowledge on malaria is essential. The school-based intervention should focus on school children as the active health messengers. To achieve a sustainable school based intervention, an active collaboration among schools, local health center (*Puskesmas*) as well as the Faculty of Medicine Mataram University is required. This method should be inexpensive and applicable to the actual operation at schools in East Lombok, particularly the targeted schools in this study.

Schools were found to have a major part of children's sources of information. There are several aspects to be considered in implementing a school-based intervention. The first is teachers expand capacity on malaria knowledge for adequate contribution to the chil-



dren's education on malaria. The second is integrating malaria knowledge into the school curriculum. Although malaria education program is not part of the national school curriculum, it is feasible to incorporate this program into the established program in schools such as School Health Unit.

Participation and support of local Health Center (*Puskesmas*) is another factor to achieve a successful school based intervention. Staffs of *Puskesmas* have the great potential to train teachers on malaria. Moreover, they may play a role in supervising the sustainability of the school-based intervention.

The research team of this study alongside with schools and staffs of *Puskesmas* could design a potential and applicable school based intervention. Future works should focus on disseminating a school base intervention with a trend analysis on the knowledge toward malaria among elementary school children prior to and after the intervention. Furthermore, similar study could be implemented in the endemic area in Lombok as well. An image that illustrates the collaboration of components required for a successful school based intervention is shown in Figure 3.1.

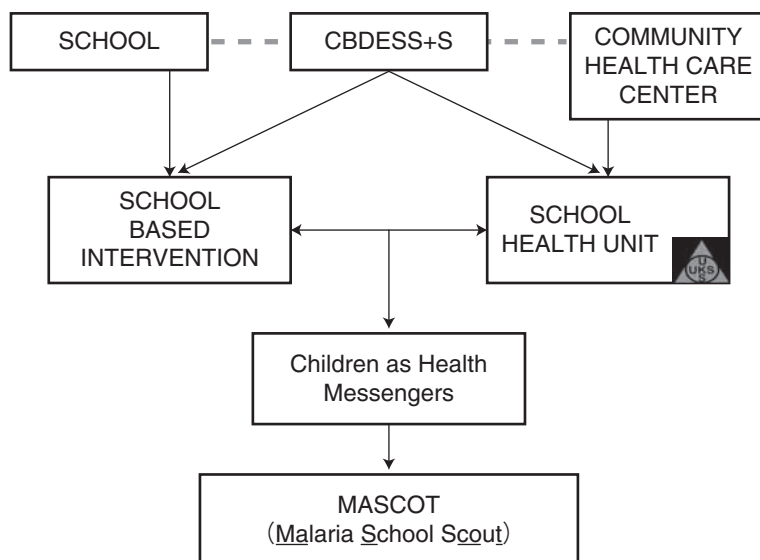


Figure 3.1 Scheme of future works on MASCOT project

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**APPENDIX:** Notes on an anime and photos of Malaria Sociological/Epidemiological Survey (CBDESS + S) in East Lombok, Indonesia.

- (1) Anime explaining results of CBDESS + S and MASCOT project for school children in Lombok  
[The Story] Buttan, a tourist from Japan, was invited to his Indonesian friends' house in East Lombok, where he met their father suffering from Malaria (page.1). Buttan and his friends brought him to Community Health Center to give him medical treatment (page.2). There, from the doctor, they also learned medical knowledge on Malaria and its prevention (page.3). Finally, their father fully recovered from Malaria. It was one of the seeds that have grown into a flowering of MASCOT (Malaria School Scout) as a fighter against Malaria. Let's fight against malaria together!
- (2) Photo #1: Members of Team MASCOT project, School of Medicine, Mataram University in 2012.
- (3) Photo #2: Interviewed survey at Pijot No.3 elementary school
- (4) Photo #3: Children's big smiles after the survey at Tanjung Luar No.1 elementary school
- (5) Photo #4: School children at Sukaraja No.2 elementary school

(みつだ ひさよし 公共政策学科)

2012年10月11日受理



(1) マラリア社会疫学調査 (CBDESS+S) 結果の小学生向けアニメ



【ストーリー】 ロンボク島を訪れた日本からの観光客ボタン君は、インドネシアの友人宅に招かれた。そこでマラリアに苦しむ父親と対面（1頁）。彼を地域診療所（Community Health Center）に連れて行き、マラリアの診断と治療を施す（2頁）。ドクターからマラリアの医学的知識を教えてもらい、その対策を学ぶ（3頁）。父親は治療の甲斐あって全快。ブタくんもインドネシアの友人と一緒に「マラリア見守り隊（Malaria School Scout: MASCOT）」としてマラリアと戦う（4頁）。





photo 2



photo 4



photo 1



photo 3